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# Interdisciplinary Studies: A Site for Bridging the Skills Divide

Michele C. Everett[1]
*Coastal Carolina University, Conway, South Carolina 29526*

**Abstract**

This study explores student learning outcomes from an Introduction to Interdisciplinary Studies course. The article focuses on students' perceptions of cognitive abilities, skills and attributes developed through participation in an interdisciplinary research and design project. Participants were 50 students enrolled in the course. A pre-post survey matched pairs design was used to analyze data generated from Likert scale responses. Content analysis was used to analyze responses to open-ended survey questions. The study's findings illustrate the potential interdisciplinary studies programs have for fostering the development of skills required for success in the workplace and for good citizenship.

**Keywords:** Interdisciplinary studies, skill development, student learning outcomes.

The debate concerning the purpose of higher education has had a long history. Today there are two main positions (Selingo, 2015). One side argues that because of the rising cost of higher education, there is an expectation that the money spent should lead to a good-paying job. Consequently, students should leave college with the skills required to succeed professionally. The other side values the overarching goal of liberal arts education—producing a well-informed, moral citizenry. Individuals who hold this view argue that students should leave college with the knowledge, skills and disposition needed to be contributing members of society. Though these two perspectives appear to be in conflict, upon further examination, this may not be the case.

The nature of today's global workplace requires specific skills to meet new challenges and demands. Results from the American Association of Colleges & Universities (AAC&U) 2013 Employer Priorities survey found that 95% of employers are looking for college graduates who can "contribute to innovation in the workplace" (Hart Research Associates, 2013, p. 1). Other priority skills and attributes identified include the "ability to solve complex problems" and "ethical judgement and integrity" (p. 1). Employers indicated that they would like universities to place more emphasis on critical thinking, oral and written communication and applied knowledge. The National Association of Colleges and Employers' (2014) Job Outlook 2015 survey also identified top skills / qualities employers are looking for today. These include the ability to work in a team (77.8%), leadership (77.8%), written communication (73.4%), problem-solving (70.9%), and a strong work ethic (70.4%). The results from these reports suggest that to prepare students

[1] Corresponding author's email: meverett@coastal.edu

for professional success, universities need to shape learning experiences that develop cognitive abilities (problem-solving, critical and creative thinking), character traits (leadership, integrity) and social skills (collaboration) (National Association of Colleges and Employers, 2014).

The seriousness of the challenges we as a society face today requires citizens to possess specific knowledge, skills and dispositions. In the context of higher education, initiatives for promoting civic engagement and global citizenship focus on developing critical thinking skills, knowledge about global issues and cultural competence (Montiel-Overall, 2012), and personal attributes such as openness, curiosity and respect (De Fazio, 2013). While many university mission statements include the goal of producing responsible citizens, to date there is little evidence that they are succeeding in fulfilling this mission (Beaumont, 2002). According to Chickering (2010), "[Universities] have so far failed to graduate citizens who have attained the levels of cognitive, moral, intellectual and ethical development required to address complex national and global problems" (p. 57). He argues, "The larger issues of interdependence, identity, purpose, meaning and integrity have been eclipsed by short term goals oriented towards securing a well-paying job upon graduation" (p. 58).

The discussion concerning outcomes from higher education raises two key questions: 1) How much emphasis should universities place on preparing individuals to not only to succeed in the workplace, but also to serve as responsible contributing members of society? 2) What strategies can universities employ to achieve both of these goals? This study illustrates how interdisciplinary studies (IDS) programs and courses can provide students with a unique opportunity to develop the professional and citizenship skills required for the 21st century.

## Conceptual Framework

This research is situated within the theories of student learning and development, and interdisciplinary studies. This study draws on Dewey's philosophy of education that views learning as an experience in which the whole person in engaged, intellectually, emotionally and with the environment in which the learning takes place. Dewey rejected the mind/body dualism and viewed thinking, acting, and feeling as intertwined and inseparable from each other. He also viewed education and society as inextricably linked—education for the purpose of social change and the greater good. For Dewey, a truly educative experience is one that brings about personal change and growth (Dewey, 1944). Current theories of student development also focus on addressing the whole person (Walker, 2008). Instead of focusing solely on cognitive development, many of the more recent theories recognize the complex nature of the developmental process and consider a number of factors that affect the way college students change and grow. For example, Chickering and Reisser's (1993) psychosocial theory identifies seven vectors or tasks students progress through during college. These tasks include cognitive, physical, emotional and interpersonal growth, identity formation and developing purpose and integrity. These theories highlight the multi-dimensional nature of student learning and develop-

ment and underscore the need to adopt a holistic approach for facilitating personal and intellectual growth (Baxter Magolda, 2009).

Because interdisciplinary research provides new possibilities for understanding and resolving some of the most pressing issues facing society today, there is growing recognition of the need for and value in interdisciplinary teaching, thinking and research in higher education (Boix Mansilla, 2005; Holley, 2009; Krometis, Clark, Gonzalez, & Leslie, 2011; Lattuca, Voigt, & Fath, 2004; Repko, 2012, 2014; Szostak, 2007). The theory of interdisciplinary studies as a way of understanding the world focuses on the key concepts of complexity (Newell, 2001), common ground and integration (Repko, 2012, 2014). According to Repko (2014), common ground "is that which is created between conflicting disciplinary insights, assumptions, concepts, or theories and makes integration possible" (p. 131). Interdisciplinary integration, the cognitive process of bringing together and blending insights from two or more disciplines, results in a broader understanding of a complex real-world problem that may lead to new viable solutions (Repko, 2014). Engaging in the processes essential for interdisciplinary work require specific cognitive abilities and dispositions, including the ability to embrace complexities, appreciate different points of view and being open to new ways of understanding the world.

## Description of the Study

### *Participants and Course Description*

Research was conducted at a medium-size, four-year public liberal arts institution located in the southeastern region of the USA. The purpose of this study was to assess student learning outcomes from an Introduction to Interdisciplinary Studies course. Study participants were 50 students enrolled in the course during three consecutive semesters, from spring 2014 to spring 2015. The 300-level three-credit course is required for interdisciplinary studies majors. It also serves as a cognate course for non-IDS majors, and therefore is open to students from all majors and academic levels. Although the make-up of students varied from semester to semester, participants in this study consisted primarily of upper-class interdisciplinary studies majors.

The course was delivered face-to-face in two 75 minute class meetings per week for 15 weeks. Repko's (2014) *Introduction to Interdisciplinary Studies* was used as the required course textbook. The overarching course goal was to provide students with an overview of the theoretical and practical applications of interdisciplinary studies in today's world. The first half of the semester focused on the foundations of interdisciplinary studies. Textbook topics covered included interdisciplinary studies and you, defining interdisciplinary studies, placing interdisciplinary studies in a historical context, becoming an interdisciplinarian, and engaging in the interdisciplinary research process. Additional time was devoted to textbook Chapter 3, "The Interdisciplinary Studies 'Cognitive Toolkit.'" This chapter describes the cognitive abilities, traits and skills of an interdisciplinarian. The material covered in the first half of the semester served to lay the groundwork for students to complete the main assignment—an interdisciplinary research project.

The second half of the semester was devoted to project-based learning (Markham, 2011). In small groups (2-4 students) students worked on a "Research & Design" (R & D) project to develop a museum exhibit proposal for a display that showcased an interdisciplinary understanding of a complex real-world problem. The project consisted of five stages: conceptual, immersion, analytic, design, and dissemination. Students selected their own project topics. Exhibit topics included terrorism, poverty in America, and sexual orientation discrimination. To complete the project, students engaged in the interdisciplinary research process as described in the course textbook (Repko, 2014). Students were given class time to work in their groups. Assessment of the project was based on a written museum exhibit proposal, oral presentation of the proposal, and student level of participation.

***Data Generation and Analysis***

A pre–post survey design was used to collect quantitative and qualitative data. Before the project was introduced, students completed a 20-item interdisciplinary skills self-assessment survey. The 20 items on the survey were adapted from cognitive abilities, skills and traits identified in Repko's (2012, 2014) interdisciplinary studies textbooks. A 5-point Likert scale was used to indicate current skill levels. Each ability, skill and trait listed on the survey was discussed before students completed the assessment form. In addition to the abilities, skills and traits rating scale, students were also asked to provide responses to open-ended questions. On the pre-survey, students were asked to list the interdisciplinary abilities, skills and traits they "need to work on"; the post-survey asked students to name the "abilities, skills and traits developed the most by engaging in interdisciplinary thinking and research." The post self-assessment survey was administered the end of the semester, after students completed the R & D project (see Table 1).

A mixed method approach was used to analyze the data; statistical analysis of the Likert scale survey responses, and content analysis (Patton, 2002) of the qualitative survey responses. The data set consisted of a total of 50 matched pairs of pre and post surveys. All quantitative data were entered on an MS Excel spreadsheet. Analytical tests were run to determine mean scores and the numerical gain between the pre and post mean scores. A two-tailed matched pairs t-test was performed to determine if there was a statistical difference in the pre and post survey responses. Qualitative data were entered on a MS Word document. Responses to open-ended questions were entered on a data table. The "find" function was used to generate a count of word occurrences that corresponded to each of the 20 items. Illustrative comments for each element were identified and recorded. Although potential limitations of the study include the sample size and the use of self-reported data, the analysis methods employed served to meet a central aim of the research—to investigate student perceptions of learning outcomes from engaging in interdisciplinary thinking and research.

**Table 1. Skills Self-Assessment Post-Survey Instrument.**

| | Current Level | | | | |
|---|---|---|---|---|---|
| **Cognitive abilities** | **High** | | **Med** | | **Low** |
| *Perspective taking*: Ability to view a problem, phenomenon, or behavior from multiple perspectives | 5 | 4 | 3 | 2 | 1 |
| *Critical thinking*: Capacity to analyze, critique and assess | 5 | 4 | 3 | 2 | 1 |
| *Integration*: Ability to blend insights from different perspectives to produce a more comprehensive understanding or create new meaning | 5 | 4 | 3 | 2 | 1 |
| **Skills** | | | | | |
| *Communicative competence*: Ability to communicate effectively with individuals from different disciplines | 5 | 4 | 3 | 2 | 1 |
| *Abstract thinking*: Ability to think of ideas and concepts not related to the problem at hand | 5 | 4 | 3 | 2 | 1 |
| *Dialectical thinking*: The ability to weigh opposing views to reach a reasonable reconciliation of positions | 5 | 4 | 3 | 2 | 1 |
| *Creative thinking*: Ability to generate new ideas | 5 | 4 | 3 | 2 | 1 |
| *Holistic thinking*: Ability to think about a problem as part of a complex system; to apply a "big picture approach" to problem solving | 5 | 4 | 3 | 2 | 1 |
| *Metacognition & reflective thinking*: Taking time to "think about your thinking" | 5 | 4 | 3 | 2 | 1 |
| **Traits** | | | | | |
| *Entrepreneurship*: Willingness to chart new territory | 5 | 4 | 3 | 2 | 1 |
| *Love of learning*: Excitement at the prospect of exploring new ideas | 5 | 4 | 3 | 2 | 1 |
| *Empathy*: Understanding the views of others | 5 | 4 | 3 | 2 | 1 |
| *Appreciation of diversity*: Being open to diverse ideas and people | 5 | 4 | 3 | 2 | 1 |
| *Humility*: Ability to recognize the limits of one's expertise (and the need to draw on insights from other disciplines) | 5 | 4 | 3 | 2 | 1 |
| *Receptive to other disciplines*: Being open to information from any and all relevant disciplinary perspectives | 5 | 4 | 3 | 2 | 1 |
| *Willingness to collaborate* (with disciplinary experts and/or as part of a team) | 5 | 4 | 3 | 2 | 1 |
| *Willing to achieve "adequacy" in multiple disciplines*: Having a basic knowledge of relevant disciplines | 5 | 4 | 3 | 2 | 1 |
| *Tolerance for ambiguity*: Accepting that understanding a complex problem is an ongoing process; being okay with uncertainty | 5 | 4 | 3 | 2 | 1 |
| *Ethical consciousness*: Recognizing and avoiding personal and disciplinary bias | 5 | 4 | 3 | 2 | 1 |
| *Civic-mindedness*: Wanting to improve the quality of life in a community | 5 | 4 | 3 | 2 | 1 |

List adapted from Repko, 2012, 2014
Abilities, skills & traits that have been developed the most by engaging in interdisciplinary thinking and research:

## Results

Students' interdisciplinary skill self-assessment surveys were analyzed to gain their perceptions of skills developed over the course of the project. Table 2 presents the quantitative survey data: pre and post-survey mean scores; mean gain scores, and p-values for each item on the survey. Analysis of the data indicates that students perceived an improvement in skills over the duration of the project. All 20 items showed a significance level at $p < .02$; 17 items met the significance level at $p < .01$. Items with the lowest p-values (highest significance) were perspective taking, integration, ethical consciousness, tolerance for ambiguity, and holistic thinking. As Figure 1 below illustrates, the items with the greatest perceived gain were the same five items, but ranked in different order: tolerance for ambiguity, holistic thinking, ethical consciousness, integration, and perspective taking. It should be noted that although the results show a mean gain in all 20 items, lower ability levels for specific items were recorded by some students on post-surveys.

Responses to the open-ended questions presented in Table 3 also suggest that students developed a range of cognitive abilities, skills and traits during the project. All 20 items were mentioned in students' comments. While some of the skills identified most often in students' comments were skills that met the higher level of statistical significance i.e., perspective taking and integration, skills that did not meet the significance level of $p < .01$ were also frequently mentioned, specifically "appreciation of diversity" and "willingness to collaborate." Both of these items had high pre-survey mean scores and therefore, the Likert-scale post-survey responses may not reflect the degree of perceived improvement. Analysis of student comments also suggests that students developed problem-

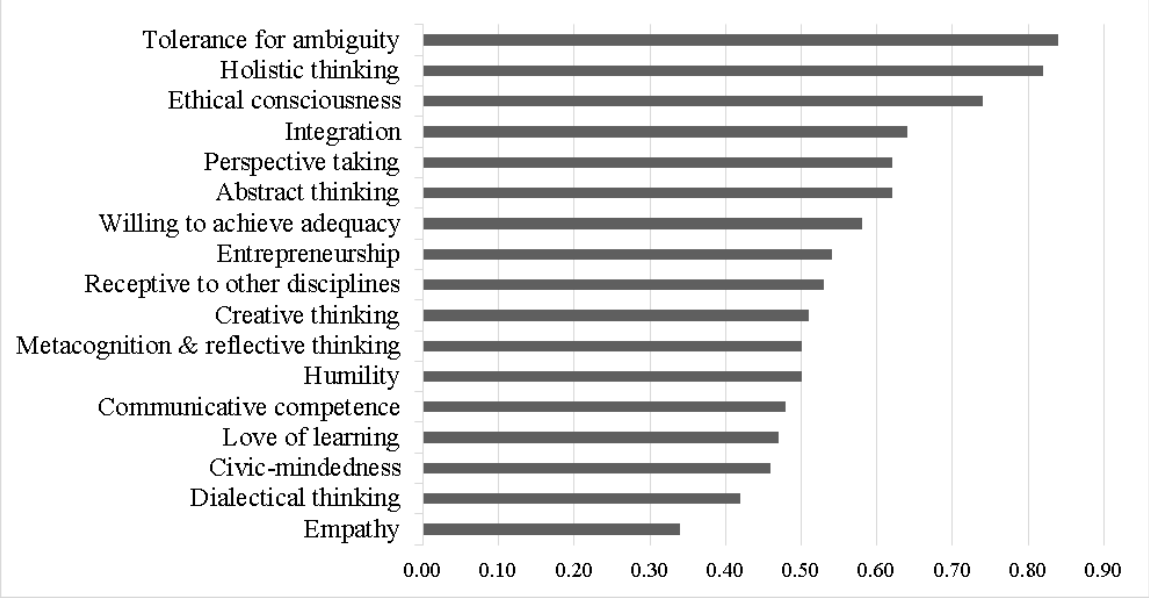


**Figure 1. Perceived Gain of Items with a Statistical Significance Level of $p < .01$**

**Table 2. Pre-Post Survey Mean Ratings in Assessment of Interdisciplinary Skills and Traits Developed.**

| *Survey Item* | *n* | *pre-survey mean score* | *post-survey mean score* | *gain* | *t* | *p* |
|---|---|---|---|---|---|---|
| 1. Perspective taking | 50 | 3.86 | 4.48 | 0.62 | 6.044 | <.001 |
| 2. Critical thinking | 50 | 3.82 | 4.28 | 0.46 | 2.676 | .010 |
| 3. Integration | 50 | 3.58 | 4.22 | 0.64 | 5.039 | <.001 |
| 4. Communicative competence | 50 | 3.92 | 4.40 | 0.48 | 3.412 | .001 |
| 5. Abstract thinking | 49 | 3.65 | 4.27 | 0.62 | 4.302 | <.001 |
| 6. Dialectical thinking | 49 | 3.82 | 4.24 | 0.42 | 3.065 | .004 |
| 7. Creative thinking | 49 | 3.84 | 4.35 | 0.51 | 3.562 | .001 |
| 8. Holistic thinking | 50 | 3.58 | 4.40 | 0.82 | 4.873 | <.001 |
| 9. Metacognition & reflective thinking | 48 | 3.69 | 4.19 | 0.50 | 3.118 | .003 |
| 10. Entrepreneurship | 50 | 3.74 | 4.28 | 0.54 | 3.841 | <.001 |
| 11. Love of learning | 49 | 4.14 | 4.61 | 0.47 | 3.783 | <.001 |
| 12. Empathy | 50 | 4.16 | 4.50 | 0.34 | 2.759 | .008 |
| 13. Appreciation of diversity | 49 | 4.27 | 4.59 | 0.32 | 2.421 | .019 |
| 14. Humility | 50 | 3.82 | 4.32 | 0.50 | 3.989 | <.001 |
| 15. Receptive to other disciplines | 49 | 3.92 | 4.45 | 0.53 | 4.846 | <.001 |
| 16. Willingness to collaborate | 49 | 4.14 | 4.51 | 0.37 | 2.644 | .011 |
| 17. Willing to achieve adequacy | 50 | 3.76 | 4.34 | 0.58 | 4.225 | <.001 |
| 18. Tolerance for ambiguity | 50 | 3.44 | 4.28 | 0.84 | 4.876 | <.001 |
| 19. Ethical consciousness | 50 | 3.58 | 4.32 | 0.74 | 5.002 | <.001 |
| 20. Civic-mindedness | 50 | 4.16 | 4.62 | 0.46 | 4.128 | <.001 |

solving skills. Although problem-solving was not listed as one of the 20 items, students expressed the view that through their engagement in the interdisciplinary research process they were able "to integrate ideas to better achieve a new idea or solution" and "to stop and think about different ways to solve a problem."

**Table 3. Post-Survey Student Comments about Skills Developed.**

| Item | Occurrence | Illustrative Quotes |
|---|---|---|
| 1. Perspective taking | 12 | · Learning to use multiple disciplines to understand & deal with a complex problem.<br>· Ability to view a problem from multiple perspectives. |
| 2. Critical thinking | 2 | · Critical thinking |
| 3. Integration | 9 | · The ability to integrate ideas to better achieve a new idea or solution.<br>· Integrate ideas to come up with a new idea. |
| 4. Communicative competence | 5 | · Communicative competence |
| 5. Abstract thinking | 3 | · Thinking outside the box. |
| 6. Dialectical thinking | 3 | · I feel like my dialectical thinking has improved. |
| 7. Creative thinking | 7 | · Generate new ideas<br>· Being able to stop and think about different ways to solve a problem. |
| 8. Holistic thinking | 3 | · Learning how to really look at the big picture. |
| 9. Metacognition & reflective thinking | 5 | · My metacognition. Taking time to slow down and gather my thoughts before continuing. |
| 10. Entrepreneurship | 4 | · Entrepreneurship |
| 11. Love of learning | 6 | · Wanting to know more (love of learning). |
| 12. Empathy | 3 | · I have definitely learned to understand and appreciate the views of others. |
| 13. Appreciation of diversity | 10 | · Taking into consideration that not everyone thinks the same way I do – have an open mind. |
| 14. Humility | 3 | · Humility |
| 15. Receptive to other disciplines | 6 | · Being able to see different sides of a problem and see the subject areas that would help me solve that problem.<br>· Being more receptive to others' ideas and disciplines. |
| 16. Willingness to collaborate | 6 | · More willing to work with others.<br>· The ability to collaborate better.<br>· Working well with others. |
| 17. Willing to achieve adequacy | 2 | · Willingness to achieve adequacy |
| 18. Tolerance for ambiguity | 1 | · Tolerance for ambiguity |
| 19. Ethical consciousness | 4 | · I have developed my openness to new ideas and reduced my bias (or at least recognize them & address them). |
| 20. Civic-mindedness | 2 | · Civic-mindedness |

## Discussion and Implications

Results from this study provide insights about the potential role interdisciplinary studies programs can play in helping universities prepare students to meet the demands of the 21st century. First, the findings document the range of skills that can be developed through an interdisciplinary studies course. The findings suggest that students believe that over the course of the project they developed intellectual capacities, personal attributes and social skills. Students indicated an improvement in a number of different cognitive abilities, including perspective taking, integration, problem-solving, abstract thinking, holistic thinking, critical and creative thinking and reflective thinking. The cognitive abilities developed encompass a broad spectrum of higher order thinking skills—skills that are essential for deeper learning (Laird, Seifert, Pascarella, Mayhew, & Blaich, 2014). Personal attributes were also developed. Attributes students identified, ethical consciousness, empathy, tolerance for ambiguity, and appreciation for diversity, contribute to moral and character development. In addition to fostering cognitive and personal growth, the interdisciplinary project provided students with opportunities to develop social skills. Meeting the aims of the project, to construct an interdisciplinary understanding of a complex real-world problem, required group members to work effectively in a team environment.

Second, the findings indicate that interdisciplinary work can help develop the skills today's employers want and need. Many of the skills developed through the project are the skills identified on employer priority lists, including the top two cognitive abilities in demand, innovation and problem-solving (Hart Research Associates, 2013). Student comments reflect the view that their work on the project stimulated creative thinking that helped them generate new ideas for the purpose of solving problems. Another top skill in demand is teamwork. Students' comments suggest that through the project, they developed the ability to engage collaboratively and work "well with others." The real-world focus of the project and the small group structure were key factors that contributed to developing the set of skills needed for today's job market.

Third, the study illustrates how interdisciplinary work can serve to foster the development of skills required for good citizenship. Students indicated that through the project they developed ethical consciousness—engaging in self-reflection and recognizing the role personal bias plays in shaping relationships, attitudes and understandings. Students also developed an appreciation of diversity, perspective-taking and empathy; attributes that require reserving judgement, willingness to listen, trying to understand other points of view and valuing individual differences. These qualities are particularly important given the divisiveness and incivility in today's society. Humility, tolerance for ambiguity and a love of learning were three additional traits developed. These traits require an acknowledgment that there may not be one right answer and that the search for understanding is an ongoing and exciting process. Many if not all of these attributes are essential to the process of shaping a citizenry committed to building a stronger society. Current efforts for developing citizenship skills in the context of higher education focus on encouraging students to participate in experiential learning, service learning and study abroad programs (see e.g., Brunell, 2013; Johnson, Grazulis, & White, 2014). This study shows

how some of these same outcomes can be achieved in the interdisciplinary studies classroom setting.

Fourth, the study finds that many of the skills employers are looking for are the same skills required for good citizenship, including the ability to solve problems, creative and critical thinking, civic mindedness, moral judgement and integrity, effective communication, and collaboration / working as a team. This finding is important because shows the false dichotomy that exists between the two sides in skills debate (Braskamp, 2008; Humphreys, 2009; Schneider, 2014). Perhaps the most significant finding from this study is not only do the skills employers need and the skills required for good citizenship intersect, but because of its real-world focus (Holley, 2009; Newell, 2010; Repko, 2014) and the nature of the work, interdisciplinary studies provides a unique opportunity for students to develop the full range of these skills. The primary tasks, finding common ground and integration require a combination of cognitive abilities, personal attributes and skills that promote both professional and civic development and growth.

The findings from this study have implications for interdisciplinary studies curriculum and programs. To achieve the desired outcomes, the curriculum should include activities that require students to: 1) Think about and investigate global issues, 2) Work collaboratively to develop the skills and traits of an interdisciplinarian, and 3) Engage in the process of problem-solving by looking for interdisciplinary connections that can provide new understandings that may lead to new discoveries and solutions for the complex real-world problems we as a society face.

Although there is growing recognition of the importance of interdisciplinary teaching, thinking and research in higher education, the findings suggest that IDS programs can do more to promote the value they may bring to institutions of higher learning. This value includes:

- Providing students with unique opportunities to develop a broad range of abilities, attributes and skills—skills needed to succeed both in the workplace and as a contributing member of society,
- Bridging the skills divide. Demonstrating that the "purpose of higher education" does not have to be an either / or debate—to develop the skills for a good paying job or the skills required for good citizenship. IDS programs can serve as a place for creating the common ground required to bring the two sides together, and
- Supporting university missions to prepare students to be responsible citizens by providing evidence of student learning as it relates to this goal.

Promoting the value IDS programs offer will require the development and implementation of communication strategies that modify current perceptions of interdisciplinary studies by providing new understandings about the potential IDS courses, programs and degrees have for making an important contribution to students, universities, the workforce and society.

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